



- ☐ Tentative Specification  
☒ Preliminary Specification  
☐ Approval Specification

**MODEL NO.: V315H3**  
**SUFFIX: LE7**

**Customer:**

**APPROVED BY**

**SIGNATURE**

Name / Title

**Note**

Please return 1 copy for your confirmation with your

| Approved By     | Checked By   | Prepared By  |
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**REVISION HISTORY**

| Version          | Date          | Page(New) | Section | Description                                     |
|------------------|---------------|-----------|---------|-------------------------------------------------|
| Ver. 1.0         | Dec. 20, 2010 | All       | All     | The Preliminary Specification was first issued. |
| www.panelook.com |               |           |         |                                                 |



## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V315H3-LE7 is a 31.5" TFT Liquid Crystal Display module with LED Backlight unit and 2ch-LVDS interface. This module supports 1920 x 1080 Full HDTV format and can display 16.7M colors (8-bit). The converter module for backlight is built-in.

### 1.2 FEATURES

- High brightness (400 nits)
- High contrast ratio (5000:1)
- Fast response time (8.5ms)
- High color saturation (NTSC 72%)
- Full HDTV (1920 x 1080 pixels) resolution, true HDTV format
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Optimized response time for 60 Hz frame rate
- Ultra wide viewing angle : Super MVA technology
- RoHs compliance

### 1.3 APPLICATION

- Standard Living Room TVs
- Public Display Application
- Home Theater Application
- MFM Application

### 1.4 GENERAL SPECIFICATIONS

| Item                   | Specification                      | Unit  | Note |
|------------------------|------------------------------------|-------|------|
| Active Area            | 698.4 (H) x 392.85 (V)             | mm    | (1)  |
| Bezel Opening Area     | 705.4(H) x 400 (V)                 | mm    |      |
| Driver Element         | a-si TFT active matrix             | -     | -    |
| Pixel Number           | 1920 x R.G.B. x 1080               | pixel | -    |
| Pixel Pitch(Sub Pixel) | 0.12125 (H) x 0.36375 (V)          | mm    | -    |
| Pixel Arrangement      | RGB vertical stripe                | -     | -    |
| Power consumption      | 43W                                | Watt  | (2)  |
| Display Colors         | 16.7M                              | color | -    |
| Display Operation Mode | Transmissive mode / Normally Black | -     | -    |
| Surface Treatment      | Anti-Glare coating (Haze 11%)      | -     | (3)  |

Note (1) Please refer to the attached drawings in chapter 9 for more information about the front and back outlines.

Note (2) Please refer sec 3.1 and 3.2 for more information of Power consumption

Note (3) The spec. of the surface treatment is temporarily for this phase. CMI reserves the rights to change this feature.

**1.5 MECHANICAL SPECIFICATIONS**

| Item        |                | Min.  | Typ.  | Max.  | Unit | Note |
|-------------|----------------|-------|-------|-------|------|------|
| Module Size | Horizontal (H) | 734.4 | 735.4 | 736.4 | mm   | (1)  |
|             | Vertical (V)   | 432   | 433   | 434   | mm   | (1)  |
|             | Depth (D)      | 9.8   | 10.8  | 11.8  | mm   | (2)  |
|             | Depth (D)      | 30.7  | 31.7  | 32.7  | mm   | (3)  |
| Weight      |                | -     | 4300  | -     | g    | -    |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Module Depth is between bezel to T-CON cover.

Note (3) Module Depth is between bezel to converter cover.

**2. ABSOLUTE MAXIMUM RATINGS****2.1 ABSOLUTE RATINGS OF ENVIRONMENT**

| Item                          | Symbol | Value |      | Unit | Note     |
|-------------------------------|--------|-------|------|------|----------|
|                               |        | Min.  | Max. |      |          |
| Storage Temperature           | TST    | -20   | +60  | °C   | (1)      |
| Operating Ambient Temperature | TOP    | 0     | 50   | °C   | (1), (2) |
| Shock (Non-Operating)         | SNOP   | -     | 50   | G    | (3), (5) |
| Vibration (Non-Operating)     | VNOP   | -     | 1.0  | G    | (4), (5) |

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ( $T_a \leq 40\text{ }^{\circ}\text{C}$ ).

(b) Wet-bulb temperature should be 39 °C Max. ( $T_a > 40\text{ }^{\circ}\text{C}$ ).

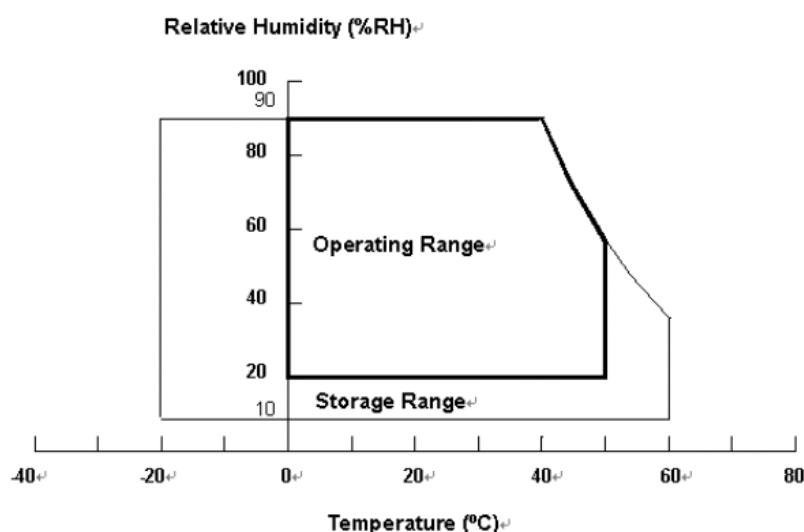
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for  $\pm X$ ,  $\pm Y$ ,  $\pm Z$ .

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



## 2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

- (a) Do not leave the module in high temperature, and high humidity for a long time, It is highly recommended to store the module with temperature from 0 to 35 °C at normal humidity without condensation.
- (b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

## 2.3 ELECTRICAL ABSOLUTE RATINGS

### 2.3.1 TFT LCD MODULE

| Item                 | Symbol | Value |      | Unit | Note |
|----------------------|--------|-------|------|------|------|
|                      |        | Min.  | Max. |      |      |
| Power Supply Voltage | VCC    | -0.3  | 13.5 | V    | (1)  |
| Logic Input Voltage  | VIN    | -0.3  | 3.6  | V    |      |

### 2.3.2 BACKLIGHT CONVERTER UNIT

| Item                 | Symbol | Value |      | Unit            | Note     |
|----------------------|--------|-------|------|-----------------|----------|
|                      |        | Min.  | Max. |                 |          |
| Light bar Voltage    | VW     | —     | 60   | V <sub>DC</sub> |          |
| Power Supply Voltage | VBL    | 0     | 30   | V               | (1)      |
| Control Signal Level | —      | -0.3  | 7    | V               | (1), (3) |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals include On/Off Control and External PWM Control.





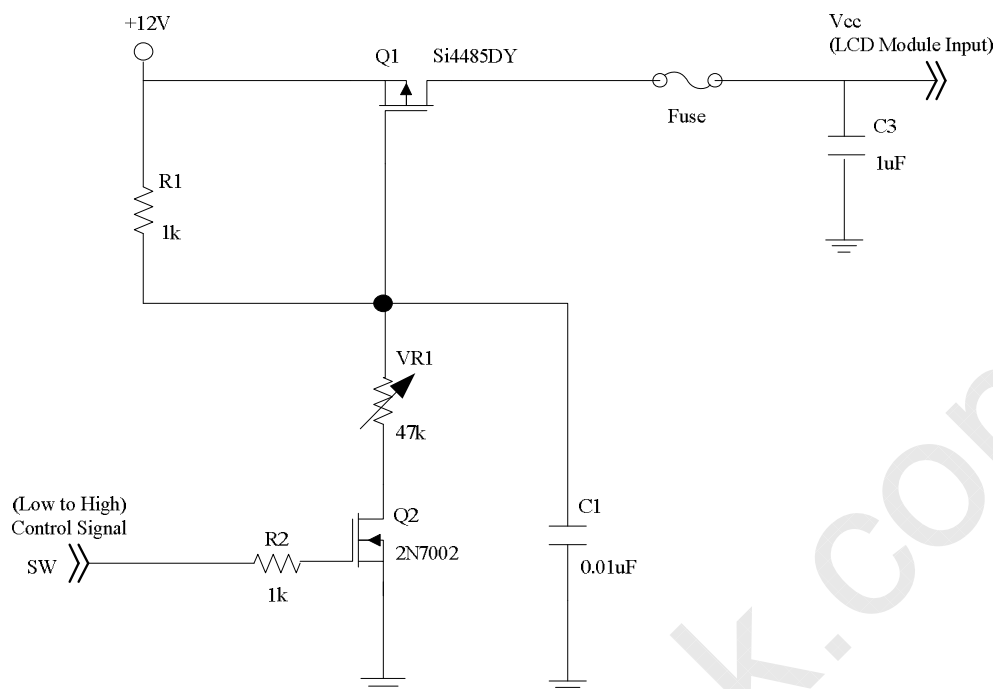
## 3. ELECTRICAL CHARACTERISTICS

### 3.1 TFT LCD MODULE

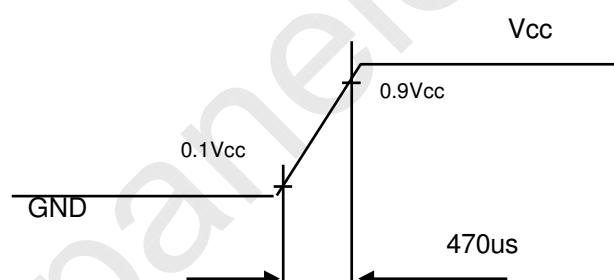
(Ta = 25 ± 2 °C)

| Parameter            |                                           | Symbol            | Value |      |      | Unit | Note |
|----------------------|-------------------------------------------|-------------------|-------|------|------|------|------|
|                      |                                           |                   | Min.  | Typ. | Max. |      |      |
| Power Supply Voltage |                                           | V <sub>CC</sub>   | 10.8  | 12   | 13.2 | V    | (1)  |
| Rush Current         |                                           | I <sub>RUSH</sub> | —     | —    | 3.0  | A    | (2)  |
| Power consumption    | White Pattern                             | —                 | —     | 4.2  | 4.6  | W    | (3)  |
|                      | Horizontal Stripe                         | —                 | —     | 6.1  | 7.4  | W    |      |
|                      | Black Pattern                             | —                 | —     | 4.2  | 4.6  | W    |      |
| Power Supply Current | White Pattern                             | —                 | —     | 0.35 | 0.38 | A    | (4)  |
|                      | Horizontal Stripe                         | —                 | —     | 0.51 | 0.62 | A    |      |
|                      | Black Pattern                             | —                 | —     | 0.35 | 0.38 | A    |      |
| LVDS interface       | Differential Input High Threshold Voltage | V <sub>LVTH</sub> | +100  | —    | —    | mV   | (5)  |
|                      | Differential Input Low Threshold Voltage  | V <sub>LVTL</sub> | —     | —    | -100 | mV   |      |
|                      | Common Input Voltage                      | V <sub>CM</sub>   | 1.0   | 1.2  | 1.4  | V    |      |
|                      | Differential input voltage (single-end)   | V <sub>ID</sub>   | 180   | —    | 600  | mV   |      |
|                      | Terminating Resistor                      | R <sub>T</sub>    | —     | 100  | —    | ohm  |      |
| CMIS interface       | Input High Threshold Voltage              | V <sub>IH</sub>   | 2.7   | —    | 3.3  | V    |      |
|                      | Input Low Threshold Voltage               | V <sub>IL</sub>   | 0     | —    | 0.7  | V    |      |

Note (1) The module should be always operated within the above ranges.



**Vcc rising time is 470us**



Note (3) The Specified Power consumption is under XXX pattern.

Note (4) The specified power supply current is under the conditions at  $V_{cc} = 12\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ ,  $f_v = 60\text{ Hz}$ , whereas a power dissipation check pattern below is displayed.

a. White Pattern



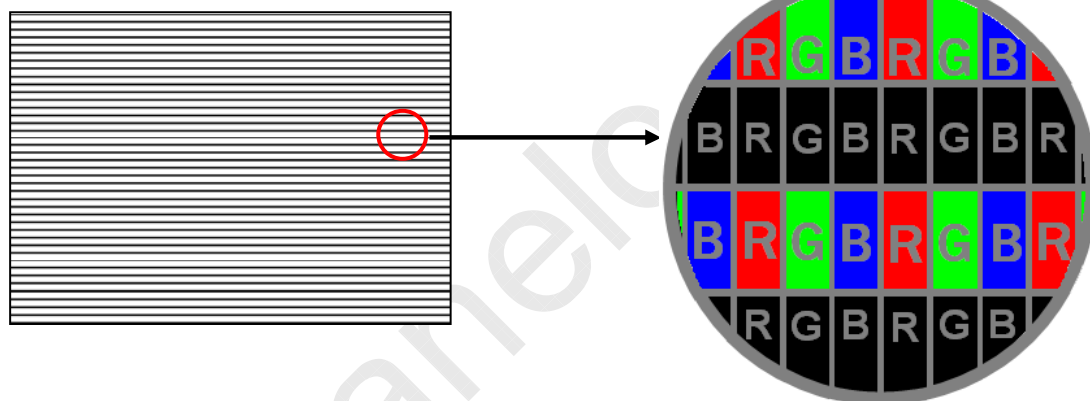
Active Area

b. Black Pattern

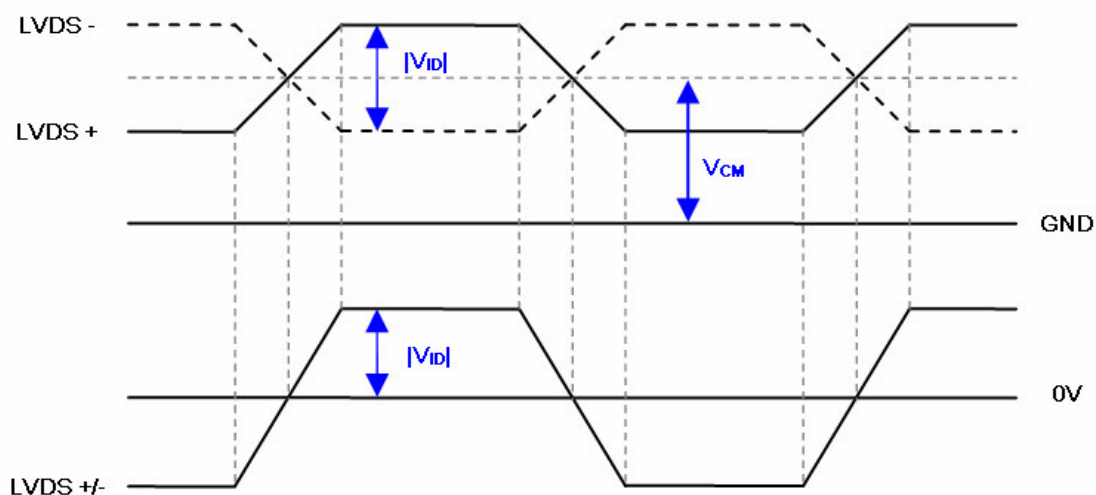


Active Area

c. Horizontal Pattern



Note (4) The LVDS input characteristics are as follows :



## 3.2 BACKLIGHT CONVERTER UNIT

### 3.2.1 LED LIGHT BAR CHARACTERISTICS (Ta = 25 ± 2 °C)

The backlight unit contains 2pcs light bar.

| Parameter                    | Symbol          | Value  |      |        | Unit            | Note                   |
|------------------------------|-----------------|--------|------|--------|-----------------|------------------------|
|                              |                 | Min.   | Typ. | Max.   |                 |                        |
| Total Current (8 String)     | I <sub>f</sub>  | -      | 960  | 1017.6 | mA              |                        |
| One String Current           | I <sub>L</sub>  | -      | 120  | 127.2  | mA              |                        |
| LED Forward Voltage          | V <sub>f</sub>  | 2.7    | 3.2  | 3.6    | V <sub>DC</sub> | I <sub>L</sub> = 120mA |
| One String Voltage           | V <sub>w</sub>  | 33.6   | -    | 43.2   | V <sub>DC</sub> | I <sub>L</sub> = 120mA |
| One String Voltage Variation | △V <sub>w</sub> | -      | -    | 2      | V               |                        |
| Life time                    | -               | 30,000 | -    | -      | Hrs             | (1)                    |

Note (1) The lifetime is defined as the time which luminance of the LED decays to 50% compared to the initial value, Operating condition: Continuous operating at Ta = 25±2°C, I<sub>L</sub> = 120mA.

### 3.2.2 CONVERTER CHARACTERISTICS (Ta = 25 ± 2 °C)

| Parameter               | Symbol           | Value |      |      | Unit              | Note                                                |
|-------------------------|------------------|-------|------|------|-------------------|-----------------------------------------------------|
|                         |                  | Min.  | Typ. | Max. |                   |                                                     |
| Power Consumption       | P <sub>BL</sub>  | -     | 41   | 46   | W                 | (1),(2) I <sub>L</sub> = 120 mA                     |
| Converter Input Voltage | V <sub>BL</sub>  | 22.8  | 24   | 25.2 | V <sub>DC</sub>   |                                                     |
| Converter Input Current | I <sub>BL</sub>  | -     | 1.7  | 1.92 | A                 | Non Dimming                                         |
| Input Inrush Current    | -                | -     | -    | 2.69 | A <sub>peak</sub> | V <sub>BL</sub> =24V, (I <sub>L</sub> =typ.)<br>(3) |
| Dimming Frequency       | F <sub>B</sub>   | 150   | 160  | 170  | Hz                |                                                     |
| Minimum Duty Ratio      | D <sub>MIN</sub> | 5     | 10   | -    | %                 | (4)                                                 |

Note (1) The power supply capacity should be higher than the total converter power consumption P<sub>BL</sub>. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when converter dimming.

Note (2) The measurement condition of Max. value is based on 31.5" backlight unit under input voltage 24V, average LED current 127.2 mA and lighting 1 hour later.

Note (3) The duration of rush current is about 30ms.

Note (4) 5% minimum duty ratio is only valid for electrical operation.

## 3.2.3 CONVERTER INTERFACE CHARACTERISTICS

| Parameter                    |     | Symbol           | Test Condition | Value |      |      | Unit | Note                                           |     |
|------------------------------|-----|------------------|----------------|-------|------|------|------|------------------------------------------------|-----|
|                              |     |                  |                | Min.  | Typ. | Max. |      |                                                |     |
| On/Off Control Voltage       | ON  | VBLON            | —              | 2.0   | —    | 5.25 | V    | (6)                                            |     |
|                              | OFF |                  | —              | 0     | —    | 0.8  | V    |                                                |     |
| External PWM Control Voltage | HI  | VEPWM            | —              | 2.0   | —    | 5.25 | V    | Duty on                                        | (5) |
|                              | LO  |                  | —              | 0     | —    | 0.8  | V    | Duty off                                       |     |
| Error Signal                 |     | ERR              | —              | —     | —    | —    | —    | Abnormal: Open collector<br>Normal: GND<br>(4) |     |
| VBL Rising Time              |     | Tr1              | —              | 30    | —    | —    | ms   | 10%-90%V <sub>BL</sub>                         |     |
| Control Signal Rising Time   |     | Tr               | —              | —     | —    | 100  | ms   |                                                |     |
| Control Signal Falling Time  |     | Tf               | —              | —     | —    | 100  | ms   |                                                |     |
| PWM Signal Rising Time       |     | TPWMR            | —              | —     | —    | 50   | us   |                                                |     |
| PWM Signal Falling Time      |     | TPWMF            | —              | —     | —    | 50   | us   |                                                |     |
| Input Impedance              |     | Rin              | —              | 1     | —    | —    | MΩ   |                                                |     |
| PWM Delay Time               |     | TPWM             | —              | 1     | —    | —    | ms   |                                                |     |
| BLON Delay Time              |     | T <sub>on</sub>  | —              | 300   | —    | —    | ms   |                                                |     |
|                              |     | T <sub>on1</sub> | —              | 300   | —    | —    | ms   |                                                |     |
| BLON Off Time                |     | Toff             | —              | 300   | —    | —    | ms   |                                                |     |

Note (1) The Dimming signal should be valid before backlight turns on by BLON signal. It is inhibited to change the external PWM signal during backlight turn on period.

Note (2) The power sequence and control signal timing are shown in the Fig.1. For a certain reason, the converter has a possibility to be damaged with wrong power sequence and control signal timing.

Note (3) While system is turned ON or OFF, the power sequences must follow as below descriptions:

Turn ON sequence: VBL → PWM signal → BLON

Turn OFF sequence: BLOFF → PWM signal → VBL

Note (4) When converter protective function is triggered, ERR will output open collector status.

Note (5) The EPWM interface that inserts a pull up resistor to 5V in Max Duty (100%), please refers to Fig.2.

Note (6) The BLON interface that inserts a pull up resistor to 5V, please refers to Fig.2.

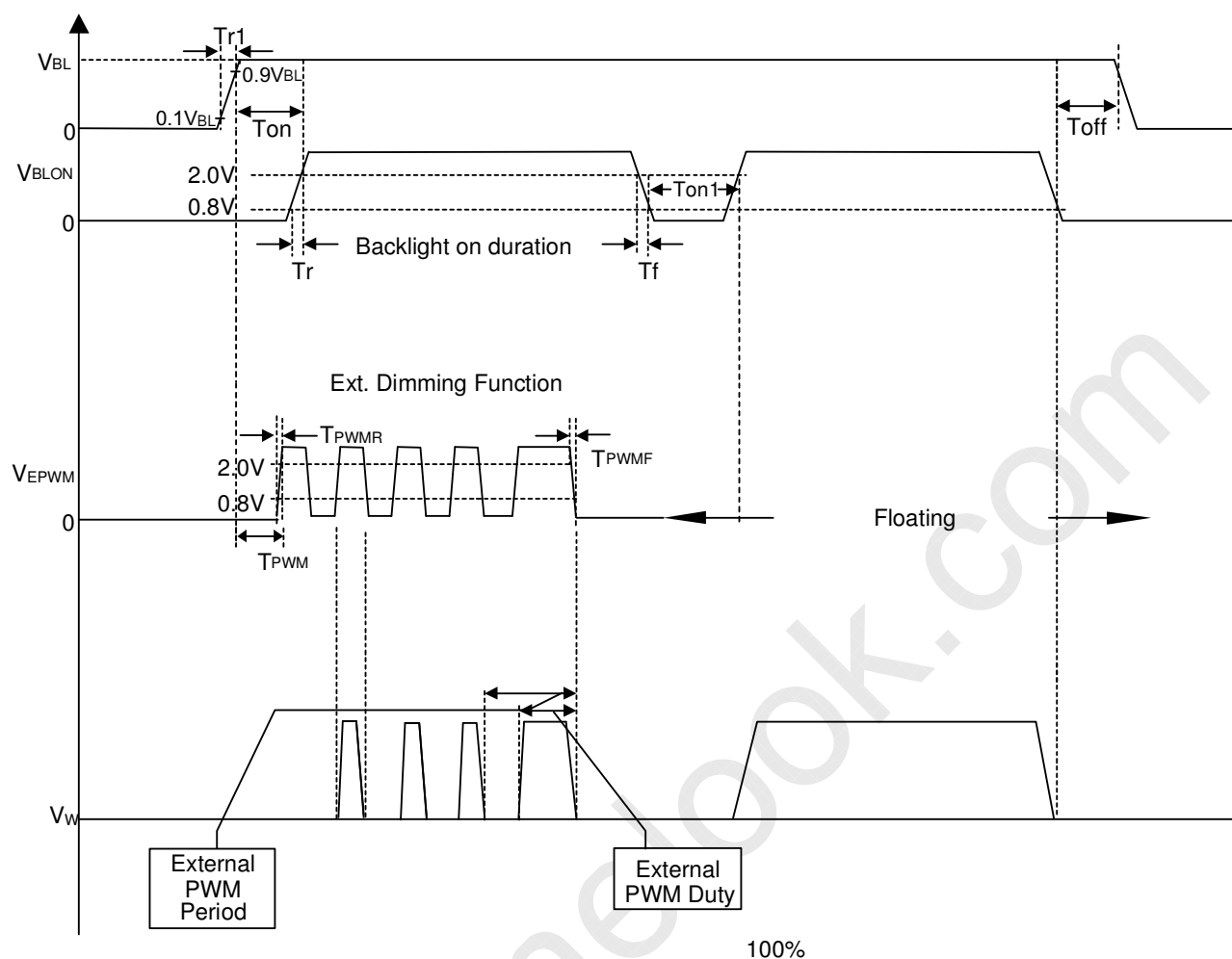


Fig. 1

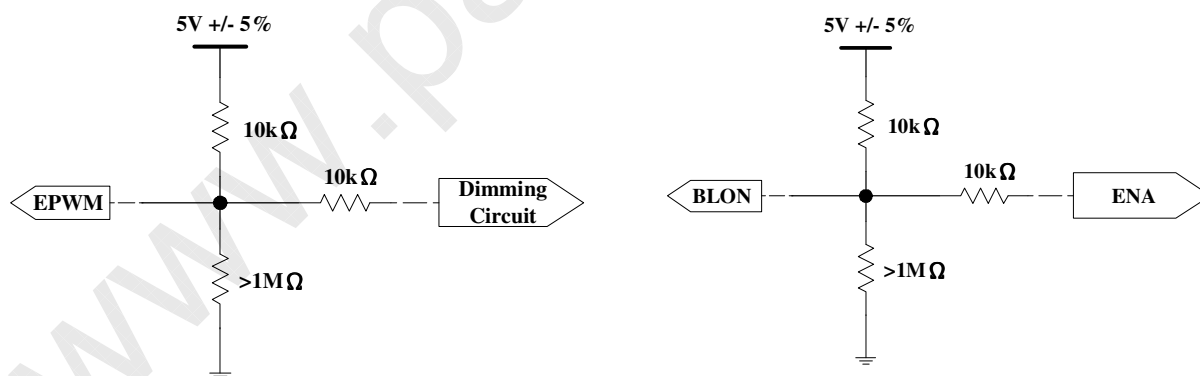
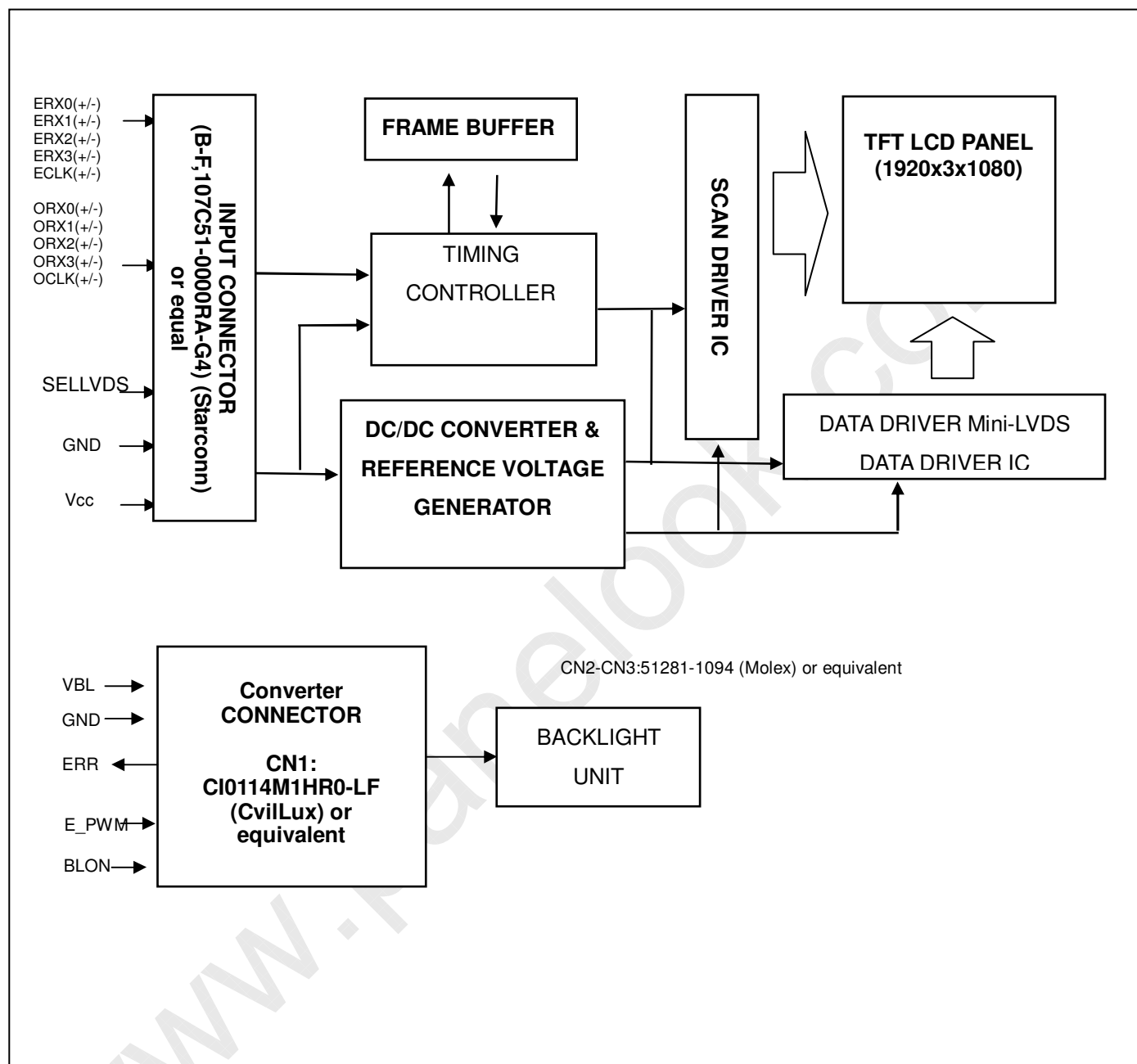


Fig. 2

## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE





## 5. INPUT TERMINAL PIN ASSIGNMENT

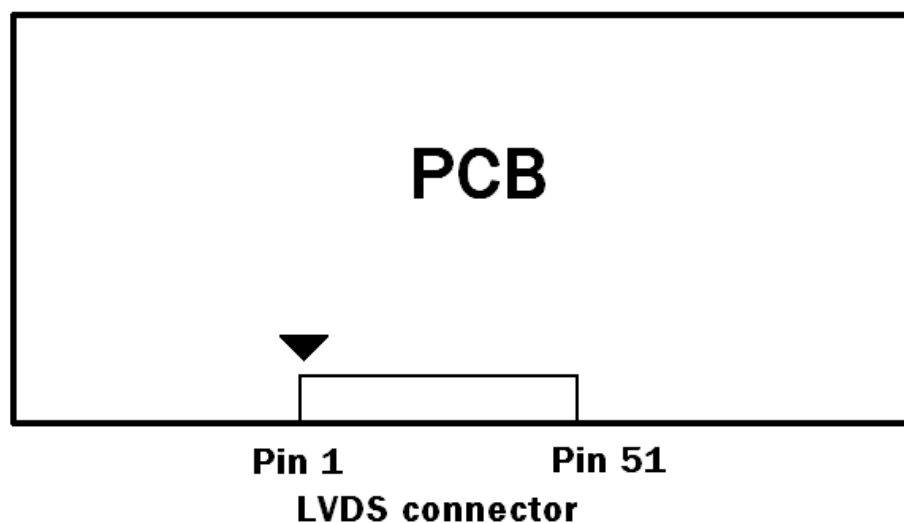
### 5.1 TFT LCD Module Input

CNF1 Connector Part No.: JAE Taiwan (台灣航空電子) FI-RE51S-HF or equivalent.

| Pin | Name    | Description                                                 | Note   |
|-----|---------|-------------------------------------------------------------|--------|
| 1   | GND     | Ground                                                      |        |
| 2   | N.C.    | No Connection                                               |        |
| 3   | N.C.    | No Connection                                               |        |
| 4   | N.C.    | No Connection                                               | (2)    |
| 5   | N.C.    | No Connection                                               |        |
| 6   | N.C.    | No Connection                                               |        |
| 7   | SELLVDS | LVDS data format Selection                                  | (3)(4) |
| 8   | N.C.    | No Connection                                               | (2)    |
| 9   | N.C.    | No Connection                                               |        |
| 10  | N.C.    | No Connection                                               | (2)    |
| 11  | GND     | Ground                                                      |        |
| 12  | ERX0-   | Even pixel Negative LVDS differential data input. Channel 0 |        |
| 13  | ERX0+   | Even pixel Positive LVDS differential data input. Channel 0 |        |
| 14  | ERX1-   | Even pixel Negative LVDS differential data input. Channel 1 |        |
| 15  | ERX1+   | Even pixel Positive LVDS differential data input. Channel 1 | (5)    |
| 16  | ERX2-   | Even pixel Negative LVDS differential data input. Channel 2 |        |
| 17  | ERX2+   | Even pixel Positive LVDS differential data input. Channel 2 |        |
| 18  | GND     | Ground                                                      |        |
| 19  | ECLK-   | Even pixel Negative LVDS differential clock input.          | (5)    |
| 20  | ECLK+   | Even pixel Positive LVDS differential clock input.          |        |
| 21  | GND     | Ground                                                      |        |
| 22  | ERX3-   | Even pixel Negative LVDS differential data input. Channel 3 | (5)    |
| 23  | ERX3+   | Even pixel Positive LVDS differential data input. Channel 3 |        |
| 24  | N.C.    | No Connection                                               | (2)    |
| 25  | N.C.    | No Connection                                               |        |
| 26  | GND     | Ground                                                      |        |
| 27  | GND     | Ground                                                      |        |
| 28  | ORX0-   | Odd pixel Negative LVDS differential data input. Channel 0  |        |
| 29  | ORX0+   | Odd pixel Positive LVDS differential data input. Channel 0  |        |
| 30  | ORX1-   | Odd pixel Negative LVDS differential data input. Channel 1  |        |
| 31  | ORX1+   | Odd pixel Positive LVDS differential data input. Channel 1  | (5)    |
| 32  | ORX2-   | Odd pixel Negative LVDS differential data input. Channel 2  |        |
| 33  | ORX2+   | Odd pixel Positive LVDS differential data input. Channel 2  |        |
| 34  | GND     | Ground                                                      |        |
| 35  | OCLK-   | Odd pixel Negative LVDS differential clock input            | (5)    |
| 36  | OCLK+   | Odd pixel Positive LVDS differential clock input            |        |
| 37  | GND     | Ground                                                      |        |
| 38  | ORX3-   | Odd pixel Negative LVDS differential data input. Channel 3  | (5)    |
| 39  | ORX3+   | Odd pixel Positive LVDS differential data input. Channel 3  |        |
| 40  | N.C.    | No Connection                                               | (2)    |
| 41  | N.C.    | No Connection                                               |        |
| 42  | GND     | Ground                                                      |        |
| 43  | GND     | Ground                                                      |        |
| 44  | GND     | Ground                                                      |        |
| 45  | GND     | Ground                                                      |        |
| 46  | GND     | Ground                                                      |        |
| 47  | N.C.    | No Connection                                               | (2)    |
| 48  | VCC     | Power input (+12V)                                          |        |
| 49  | VCC     | Power input (+12V)                                          |        |
| 50  | VCC     | Power input (+12V)                                          |        |
| 51  | VCC     | Power input (+12V)                                          |        |



Note (1) LVDS connector pin order defined as follows



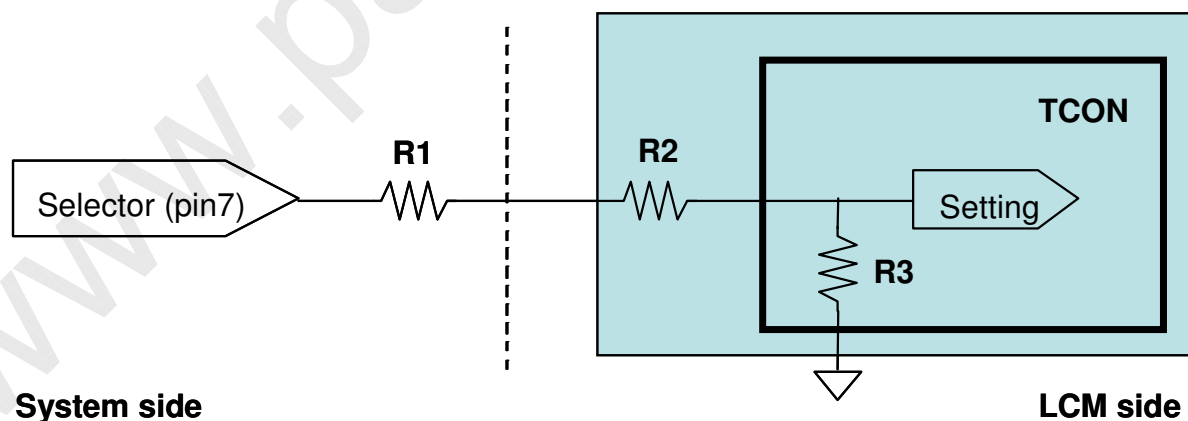
Note (2) Reserved for internal use. Please leave it open.

Note (3)

| SELLVDS    | Mode  |
|------------|-------|
| L(default) | VESA  |
| H          | JEIDA |

L: Connect to GND, H: Connect to +3.3V

Note (4) LVDS signal pin connected to the LCM side has the following diagram. R1 in the system side should be less than 1K Ohm. ( $R1 < 1K \text{ Ohm}$ )



Note (5) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel

## 5.2 BACKLIGHT UNIT

The pin configuration for the housing and the leader wire is shown in the table below.

CN: 51281-1094 (Molex)

| Pin № | Symbol | Feature                |
|-------|--------|------------------------|
| 1     | VLED+  | Positive of LED String |
| 2     |        |                        |
| 3     | NC     | NC                     |
| 4     |        |                        |
| 5     |        |                        |
| 6     |        |                        |
| 7     | N1     | Negative of LED String |
| 8     | N2     |                        |
| 9     | N3     |                        |
| 10    | N4     |                        |

## 5.3 CONVERTER UNIT

CN1(Header): CI0114M1HR0-LF (CvilLux)

| Pin № | Symbol | Feature                                   |
|-------|--------|-------------------------------------------|
| 1     | VBL    | +24V                                      |
| 2     |        |                                           |
| 3     |        |                                           |
| 4     |        |                                           |
| 5     |        |                                           |
| 6     | GND    | GND                                       |
| 7     |        |                                           |
| 8     |        |                                           |
| 9     |        |                                           |
| 10    |        |                                           |
| 11    | ERR    | Normal (GND)<br>Abnormal (Open collector) |
| 12    | BLON   | BL ON/OFF                                 |
| 13    | NC     | NC                                        |
| 14    | E_PWM  | External PWM Control                      |

### Notice

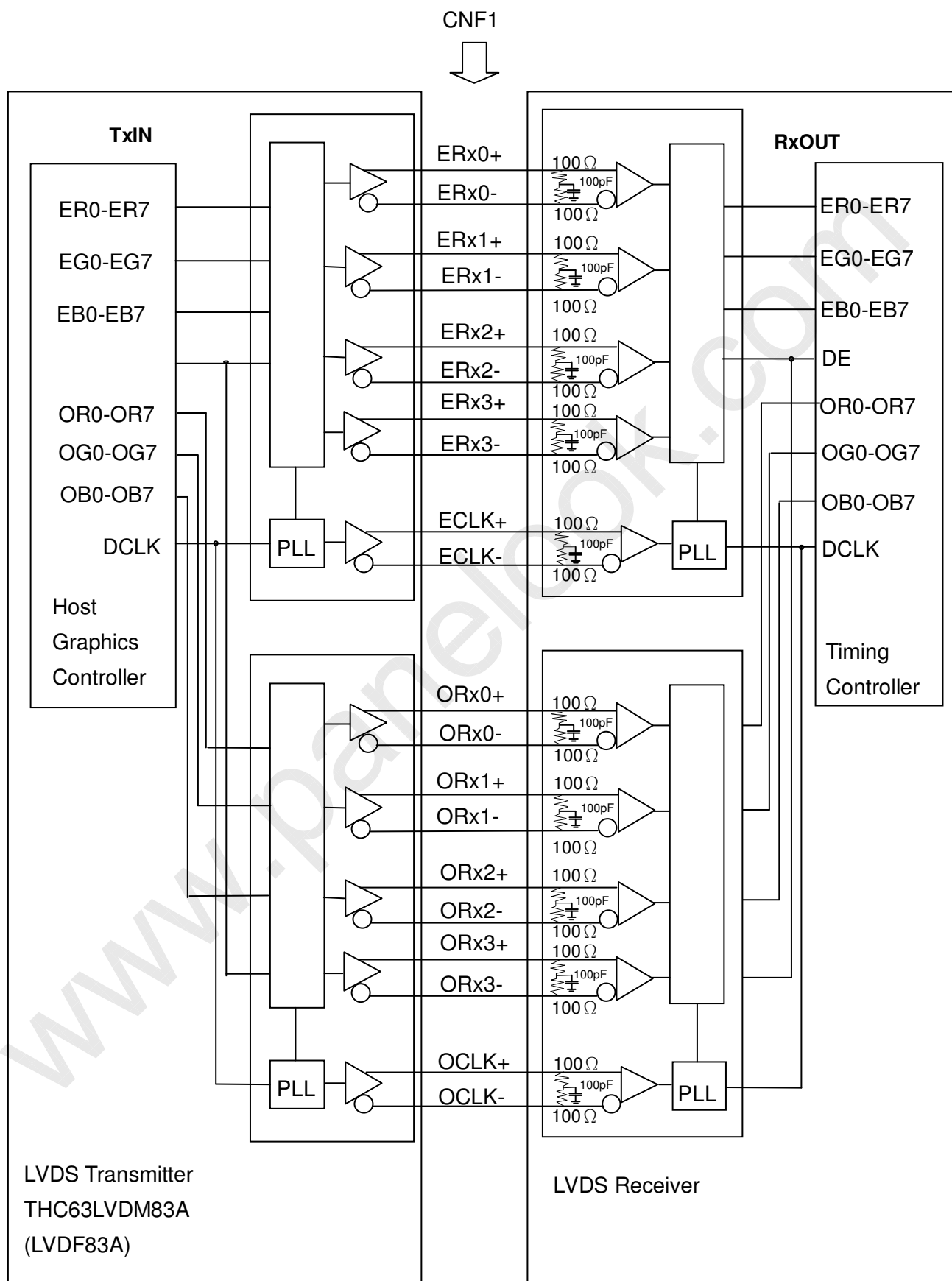
1. If Pin14 is open, E\_PWM is 100% duty.
2. If Pin12 is open, BLU is turned on.



CN2~3: 51281-1094 (Molex)

| Pin No | Symbol | Feature                |
|--------|--------|------------------------|
| 1      | VLED+  | Positive of LED String |
| 2      |        |                        |
| 3      | NC     | NC                     |
| 4      |        |                        |
| 5      |        |                        |
| 6      |        |                        |
| 7      | N1     | Negative of LED String |
| 8      | N2     |                        |
| 9      | N3     |                        |
| 10     | N4     |                        |

## 5.4 BLOCK DIAGRAM OF INTERFACE





|         |                   |         |                    |
|---------|-------------------|---------|--------------------|
| ER0~ER7 | Even pixel R data | OR0~OR7 | Odd pixel R data   |
| EG0~EG7 | Even pixel G data | OG0~OG7 | Odd pixel G data   |
| EB0~EB7 | Even pixel B data | OB0~OB7 | Odd pixel B data   |
|         |                   | DE      | Data enable signal |
|         |                   | DCLK    | Data clock signal  |

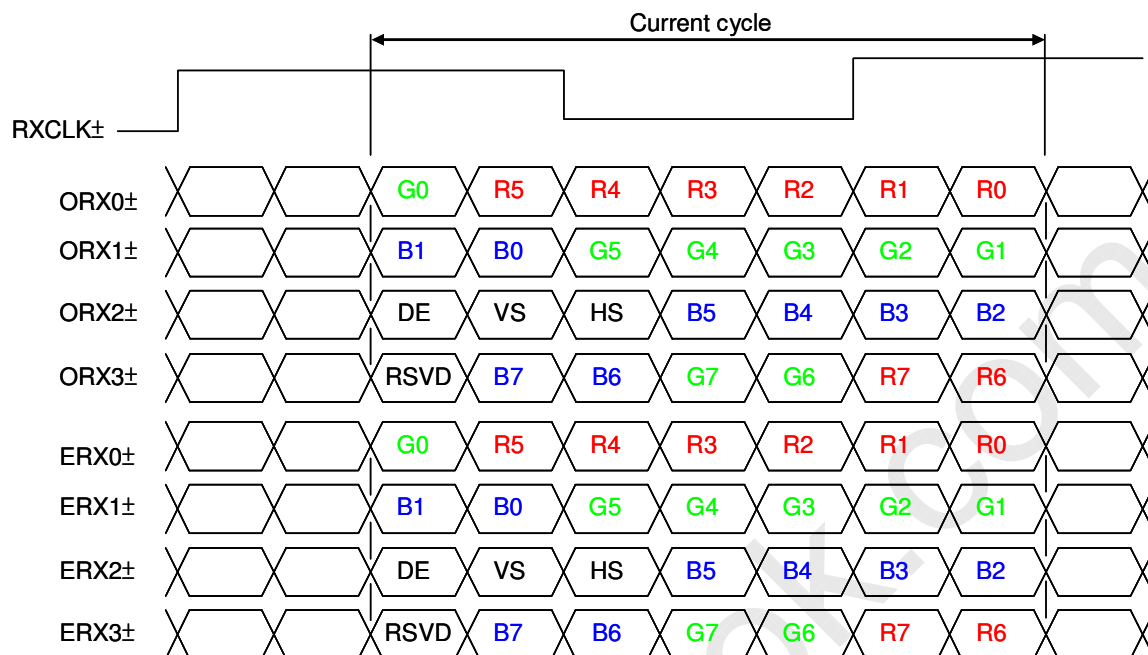
Note (1) The system must have the transmitter to drive the module.

Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

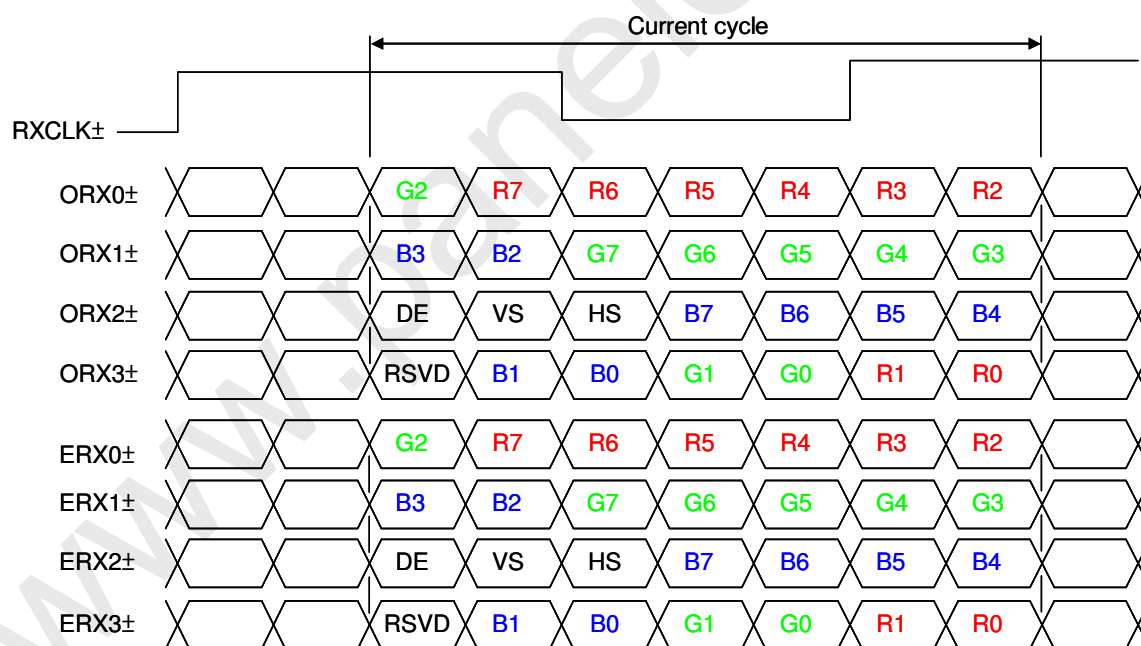
Note (3) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel.

## 5.5 LVDS INTERFACE

VESA LVDS format : (SELLVDS pin=L or open)



JEDIA LVDS format : (SELLVDS pin=H)



R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE : Data enable signal

DCLK : Data clock signal

Notes: (1) RSVD (reserved) pins on the transmitter shall be "H" or "L".

## 5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

| Color               |                  | Data Signal |    |    |    |    |    |    |    |       |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |
|---------------------|------------------|-------------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|
|                     |                  | Red         |    |    |    |    |    |    |    | Green |    |    |    |    |    |    |    | Blue |    |    |    |    |    |    |    |
|                     |                  | R7          | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7    | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7   | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors        | Black            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red              | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Blue             | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Cyan             | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Magenta          | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow           | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | White            | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Gray Scale Of Red   | Red (0) / Dark   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (1)          | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (2)          | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | Red (253)        | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (254)        | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (255)        | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale Of Green | Green (0) / Dark | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (1)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (2)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | Green (253)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (254)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (255)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale Of Blue  | Blue (0) / Dark  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Blue (1)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
|                     | Blue (2)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | Blue (253)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 0  | 1  |
|                     | Blue (254)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 0  |
|                     | Blue (255)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(Ta = 25 ± 2 °C)

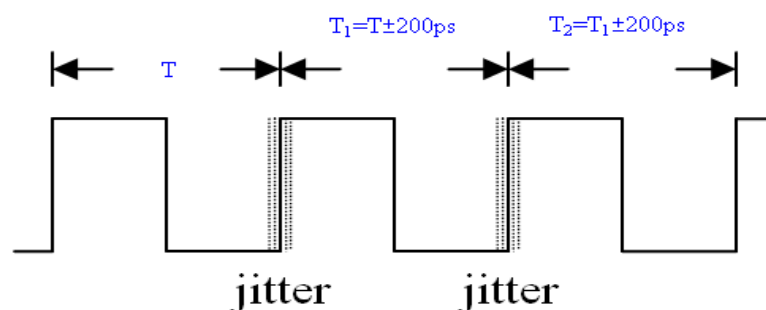
The input signal timing specifications are shown as the following table and timing diagram.

| Signal                         | Item                                 | Symbol                     | Min.                   | Typ.  | Max.                   | Unit | Note                                       |
|--------------------------------|--------------------------------------|----------------------------|------------------------|-------|------------------------|------|--------------------------------------------|
| LVDS Receiver Clock            | Frequency                            | $F_{\text{clkin}} (=1/TC)$ | 60                     | 74.25 | 80                     | MHz  |                                            |
|                                | Input cycle to cycle jitter          | $T_{\text{rcl}}$           | —                      | —     | 200                    | ps   | (2)                                        |
|                                | Spread spectrum modulation range     | $F_{\text{clkin\_mod}}$    | $F_{\text{clkin}}-2\%$ | —     | $F_{\text{clkin}}+2\%$ | MHz  | (3)                                        |
|                                | Spread spectrum modulation frequency | $F_{\text{SSM}}$           | —                      | —     | 200                    | KHz  |                                            |
| LVDS Receiver Data             | Setup Time                           | $T_{\text{lvsu}}$          | 600                    | —     | —                      | ps   |                                            |
|                                | Hold Time                            | $T_{\text{lvhd}}$          | 600                    | —     | —                      | ps   |                                            |
| Vertical Active Display Term   | Frame Rate                           | $F_{\text{r5}}$            | 47                     | 50    | 53                     | Hz   |                                            |
|                                |                                      | $F_{\text{r6}}$            | 57                     | 60    | 63                     | Hz   |                                            |
|                                | Total                                | $T_{\text{v}}$             | 1115                   | 1125  | 1135                   | Th   | $T_{\text{v}}=T_{\text{vd}}+T_{\text{vb}}$ |
|                                | Display                              | $T_{\text{vd}}$            | 1080                   | 1080  | 1080                   | Th   |                                            |
|                                | Blank                                | $T_{\text{vb}}$            | 35                     | 45    | 55                     | Th   |                                            |
| Horizontal Active Display Term | Total                                | $T_{\text{h}}$             | 1050                   | 1100  | 1150                   | Tc   | $T_{\text{h}}=T_{\text{hd}}+T_{\text{hb}}$ |
|                                | Display                              | $T_{\text{hd}}$            | 960                    | 960   | 960                    | Tc   |                                            |
|                                | Blank                                | $T_{\text{hb}}$            | 90                     | 140   | 190                    | Tc   |                                            |

Note (1) Please make sure the range of frame rate has follow the below equation :

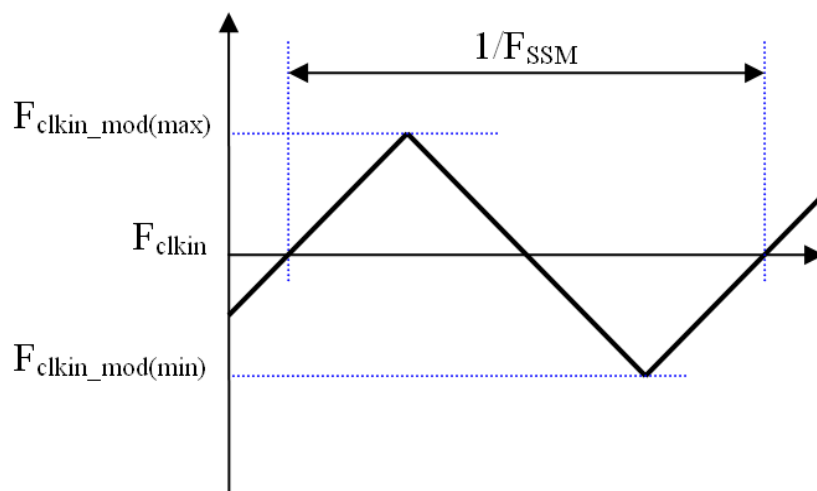
$$Fr(\text{max}) \geq F_{\text{clkin}} \quad / \quad T_{\text{v}} \times T_{\text{h}} \leq Fr(\text{min})$$

Note (2) The input clock cycle-to-cycle jitter is defined as below figures.  $T_{\text{rcl}} = |T_1 - T_1|$





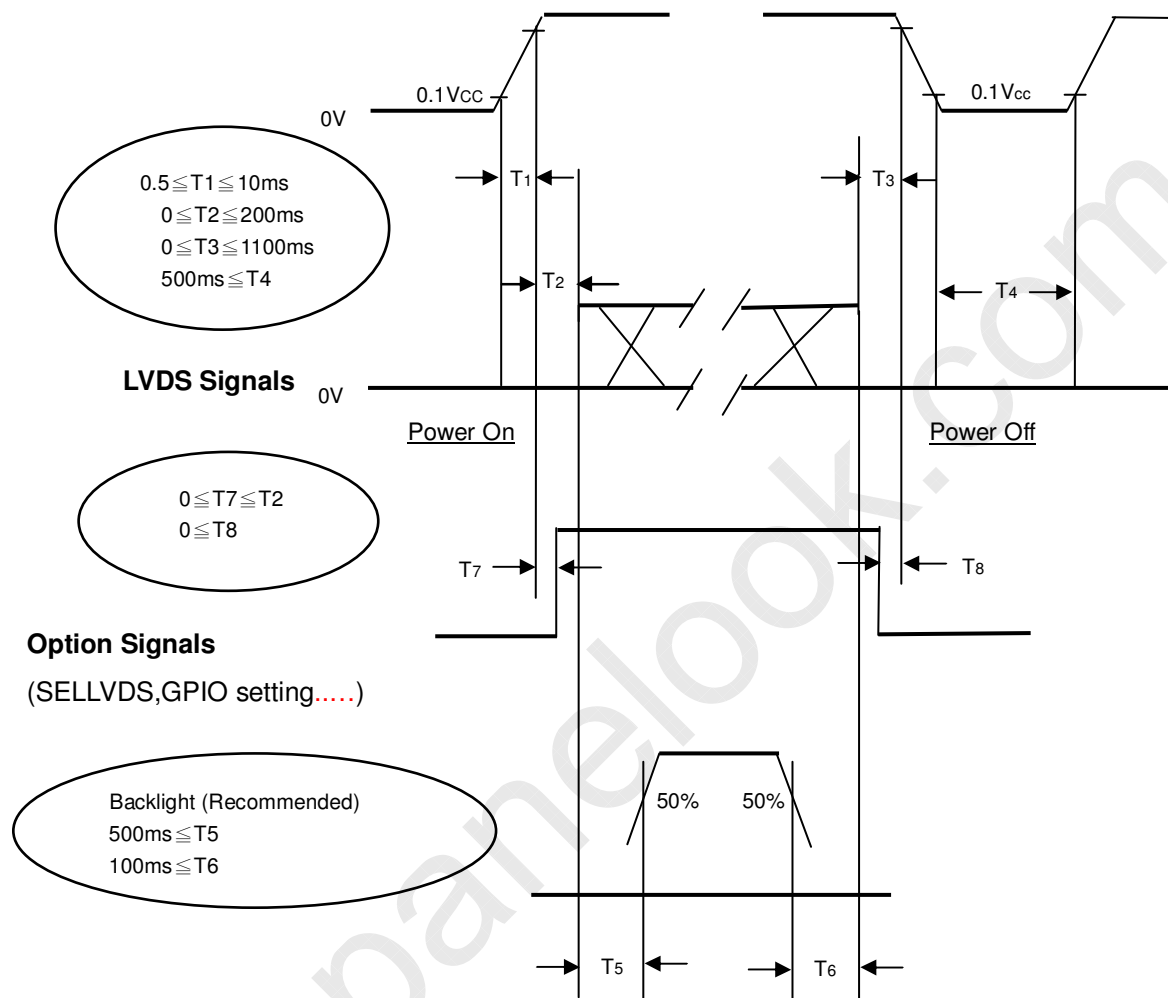
Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



## 6.2 POWER ON/OFF SEQUENCE

( $T_a = 25 \pm 2^\circ\text{C}$ )

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



### Power ON/OFF Sequence

Note (1) The supply voltage of the external system for the module input should follow the definition of V<sub>CC</sub>.

Note (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of V<sub>CC</sub> is in off level, please keep the level of input signals on the low or high impedance.

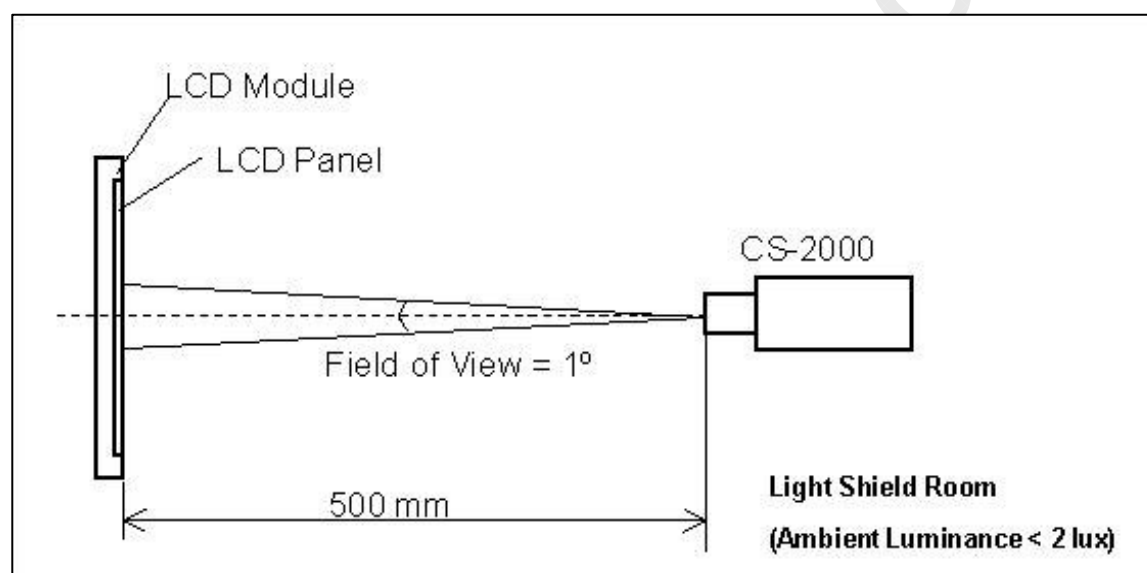
Note (4) T<sub>4</sub> should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

**7. OPTICAL CHARACTERISTICS****7.1 TEST CONDITIONS**

| Item                | Symbol                                                        | Value   | Unit |
|---------------------|---------------------------------------------------------------|---------|------|
| Ambient Temperature | Ta                                                            | 25±2    | oC   |
| Ambient Humidity    | Ha                                                            | 50±10   | %RH  |
| Supply Voltage      | V <sub>CC</sub>                                               | 12      | V    |
| Input Signal        | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |         |      |
| LED Current         | I <sub>L</sub>                                                | 120±7.2 | mA   |

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.





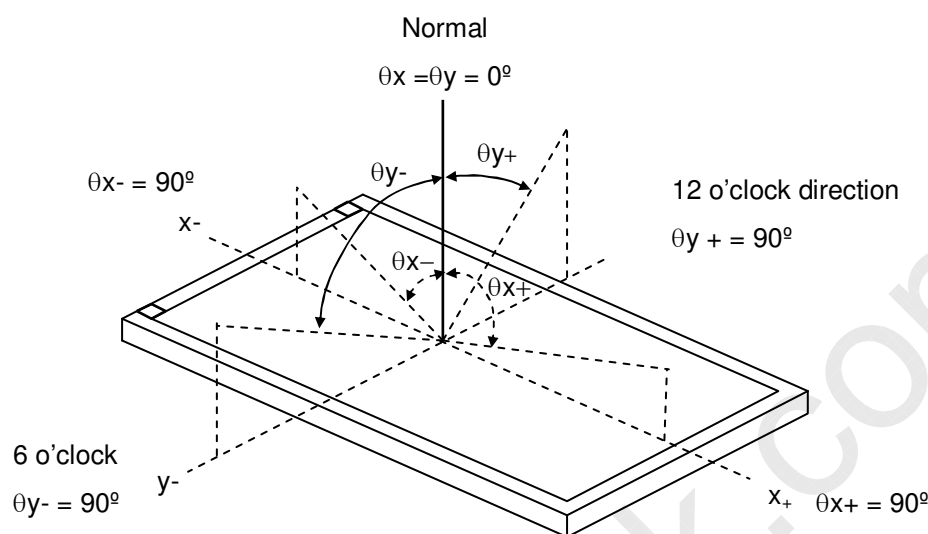
## 7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in 7.1.

| Item                      |             | Symbol        | Condition                                                                    | Min.          | Typ.   | Max.          | Unit              | Note |
|---------------------------|-------------|---------------|------------------------------------------------------------------------------|---------------|--------|---------------|-------------------|------|
| Contrast Ratio            |             | CR            | $\theta_x=0^\circ, \theta_y=0^\circ$<br>Viewing angle<br>at normal direction | 3500          | 5000   | -             | -                 | (2)  |
| Response Time (VA)        |             | Gray to gray  |                                                                              | -             | 8.5    | -             | ms                | (3)  |
| Center Luminance of White |             | $L_c$         |                                                                              | 320           | 400    | -             | cd/m <sup>2</sup> | (4)  |
| White Variation           |             | $\delta W$    |                                                                              | -             | -      | 1.3           | -                 | (6)  |
| Cross Talk                |             | CT            |                                                                              | -             | -      | 4             | %                 | (5)  |
| Color Chromaticity        | Red         | Rx            |                                                                              | Typ.<br>-0.03 | 0.635  | Typ.<br>+0.03 | -                 | -    |
|                           |             | Ry            |                                                                              |               | 0.330  |               | -                 |      |
|                           | Green       | Gx            |                                                                              |               | 0.299  |               | -                 |      |
|                           |             | Gy            |                                                                              |               | 0.623  |               | -                 |      |
|                           | Blue        | Bx            |                                                                              |               | 0.152  |               | -                 |      |
|                           |             | By            |                                                                              |               | 0.054  |               | -                 |      |
|                           | White       | Wx            |                                                                              |               | 0.280  |               | -                 |      |
|                           |             | Wy            |                                                                              |               | 0.290  |               | -                 |      |
|                           | Color Gamut |               | C.G                                                                          | -             | 72     | -             | %                 | NTSC |
|                           |             |               |                                                                              |               |        |               |                   |      |
| Viewing Angle             | Horizontal  | $\theta_{x+}$ | CR $\geq$ 20 (VA)                                                            | -             | 88(VA) | -             | Deg.              | (1)  |
|                           |             | $\theta_{x-}$ |                                                                              | -             | 88(VA) | -             |                   |      |
|                           | Vertical    | $\theta_{Y+}$ |                                                                              | -             | 88(VA) | -             |                   |      |
|                           |             | $\theta_{Y-}$ |                                                                              | -             | 88(VA) | -             |                   |      |

Note (1) Definition of Viewing Angle ( $\theta_x$ ,  $\theta_y$ ) :

Viewing angles are measured by Conoscope Cono-80 ( or Eldim EZ-Contrast 160R )



Note (2) Definition of Contrast Ratio (CR) :

The contrast ratio can be calculated by the following expression.

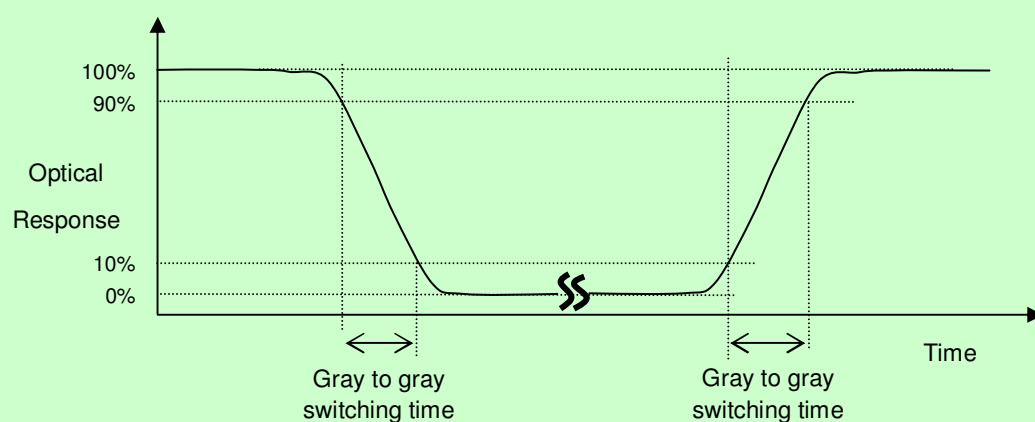
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (3) Definition of Gray-to-Gray Switching Time:

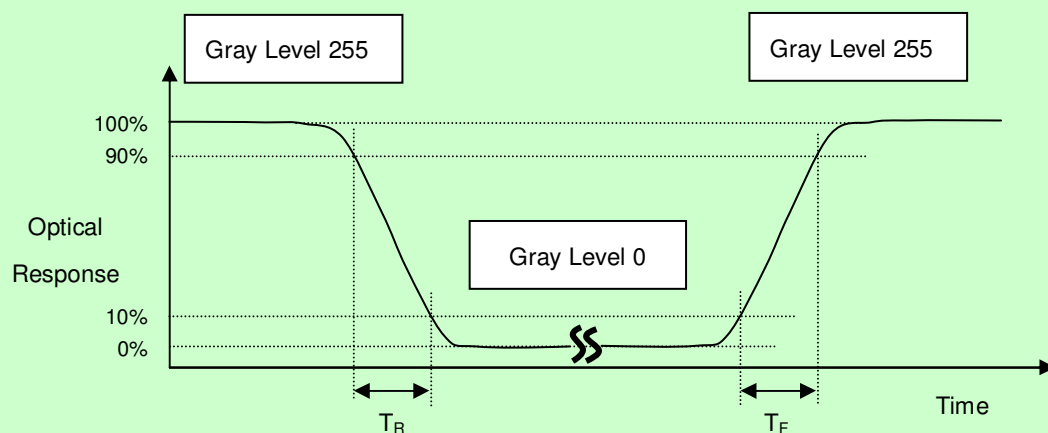


The driving signal means the signal of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023.

Gray to gray average time means the average switching time of gray level 0, 124, 252, 380, 508, 636,

764, 892 and 1023 to each other.

Note (3) Definition of Response Time ( $T_R$ ,  $T_F$ ):



Note (4) Definition of Luminance of White ( $L_C$ ):

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L(5)$ , where  $L(X)$  is corresponding to the luminance of the point X at the figure in Note (6).

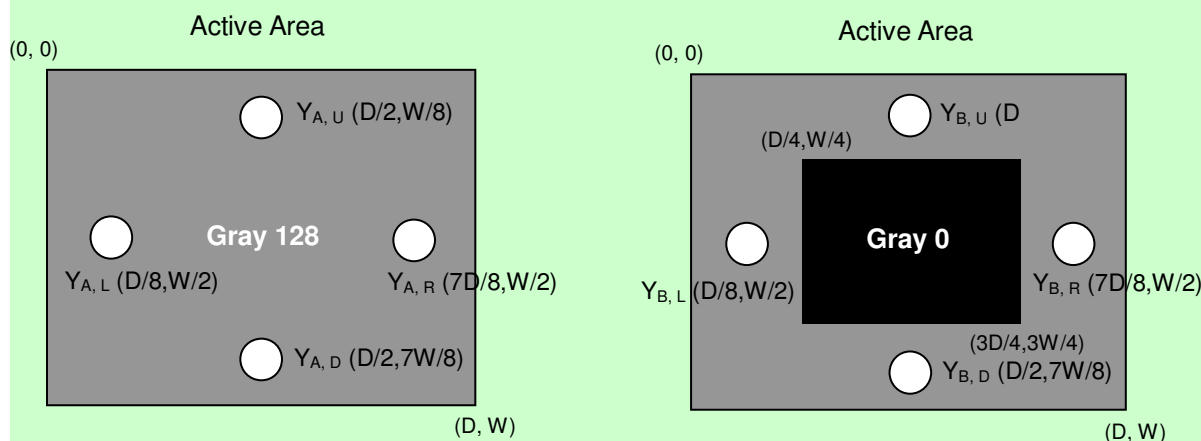
Note (5) Definition of Cross Talk (CT):

$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where:

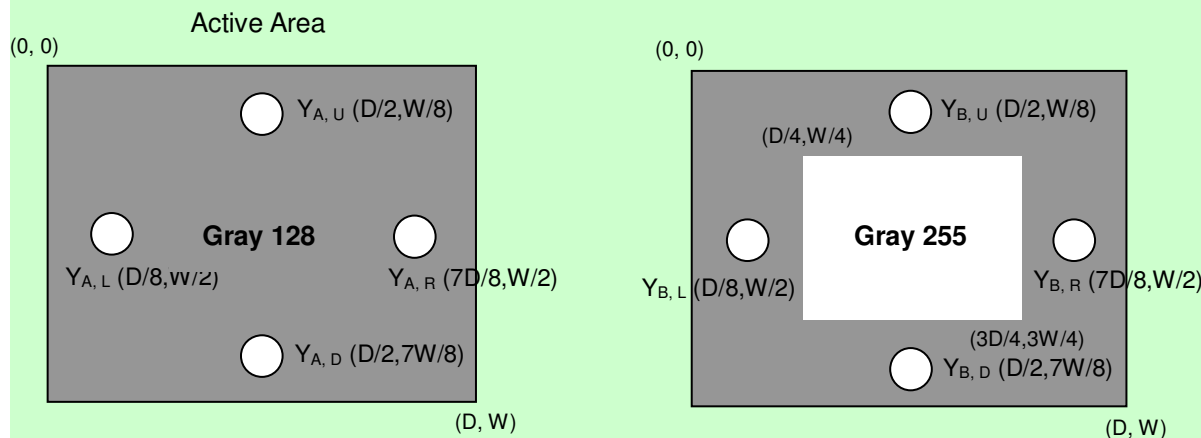
$Y_A$  = Luminance of measured location without gray level 0 pattern (cd/m<sup>2</sup>)

$Y_B$  = Luminance of measured location with gray level 0 pattern (cd/m<sup>2</sup>)



$Y_A$  = Luminance of measured location without gray level 255 pattern (cd/m<sup>2</sup>)

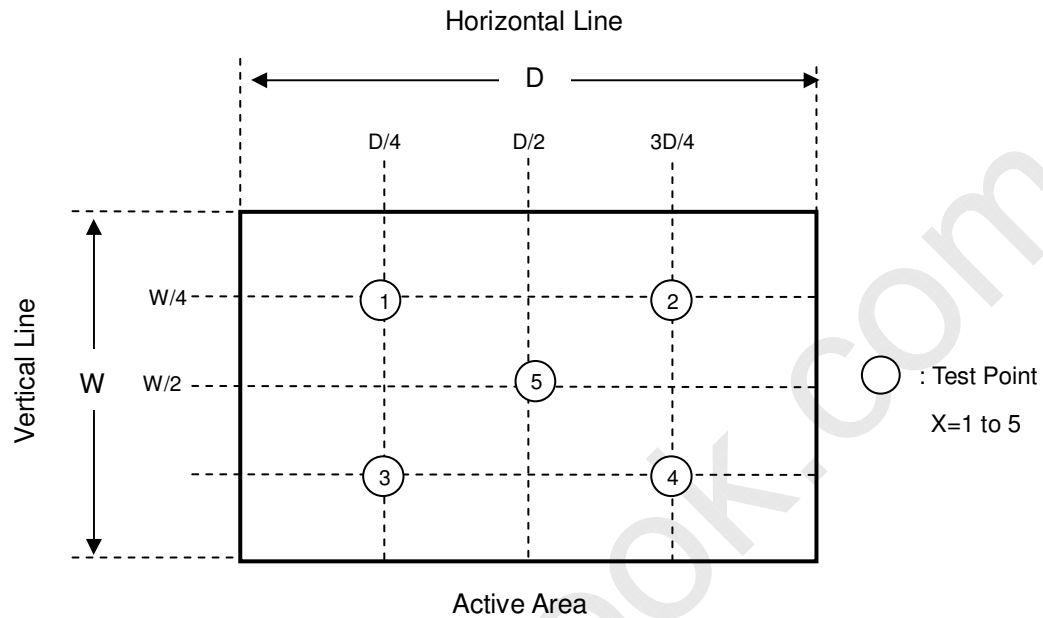
$Y_B$  = Luminance of measured location with gray level 255 pattern (cd/m<sup>2</sup>)



Note (6) Definition of White Variation ( $\delta W$ ):

Measure the luminance of gray level 255 at 5 points

$$\delta W = \text{Maximum } [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum } [L(1), L(2), L(3), L(4), L(5)]$$







## 8 PRECAUTIONS

### 8.1 ASSEMBLY AND HANDLING PRECAUTIONS

- [ 1 ] Do not apply rough force such as bending or twisting to the module during assembly.
- [ 2 ] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- [ 3 ] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
- [ 4 ] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMIS LSI chips.
- [ 5 ] Bezel of Set can not press or touch the panel surface. It will make light leakage or scrape.
- [ 6 ] Do not plug in or pull out the I/F connector while the module is in operation.
- [ 7 ] Do not disassemble the module.
- [ 8 ] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- [ 9 ] Moisture can easily penetrate into LCD module and may cause the damage during operation.
- [ 10 ] When storing modules as spares for a long time, the following precaution is necessary.
  - [ 10.1 ] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C at normal humidity without condensation.
  - [ 10.2 ] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.
- [ 11 ] When ambient temperature is lower than 10°C, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

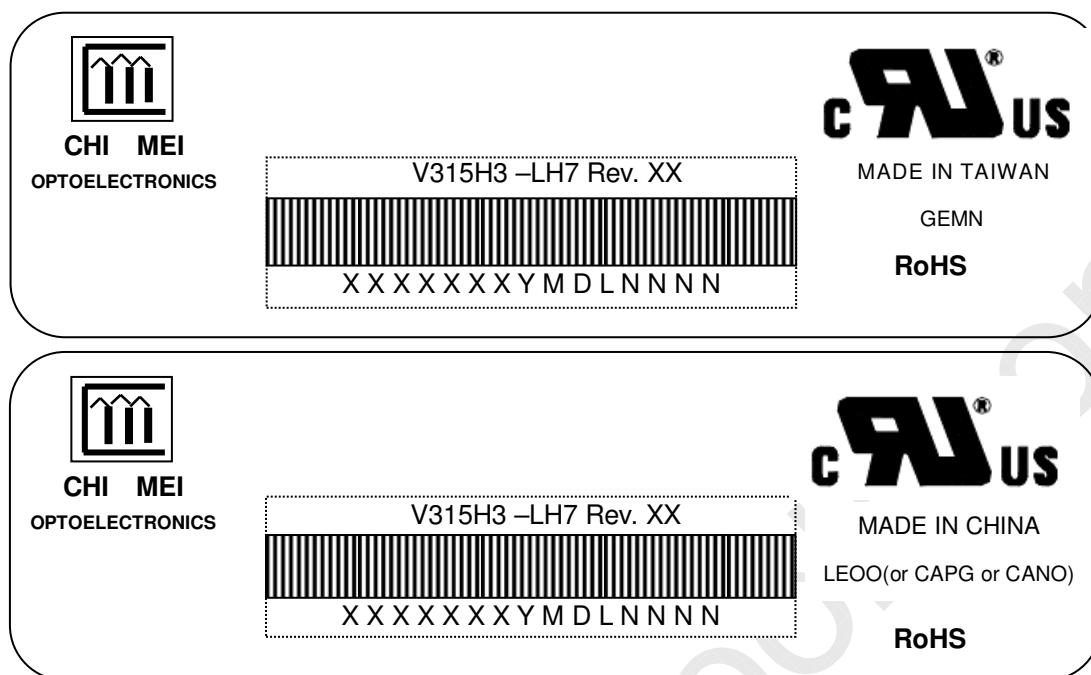
### 8.2 SAFETY PRECAUTIONS

- [ 1 ] The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.
- [ 2 ] If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- [ 3 ] After the module's end of life, it is not harmful in case of normal operation and storage.

## 9. DEFINITION OF LABELS

### 9.1 CMI MODULE LABEL

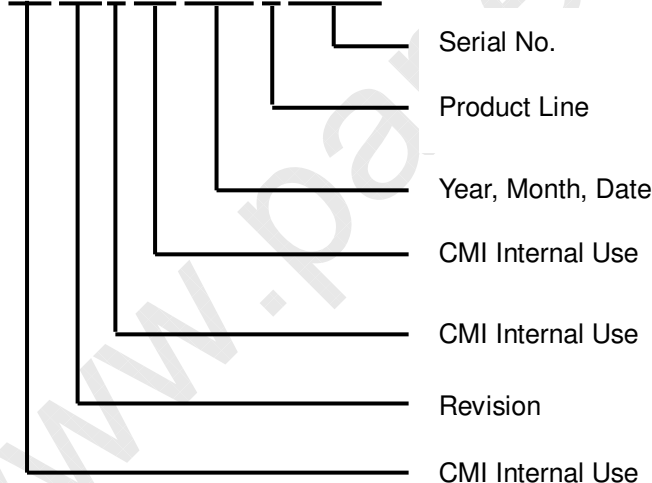
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



Model Name: V315H3-LH7

Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

Serial ID: XXXXXYYMDLNNNN



Serial ID includes the information as below:

Manufactured Date:

Year : 2001=1, 2002=2, 2003=3, 2004=4...2010=0, 2011=1, 2012=2...

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I, O, and U.

Revision Code : Cover all the change

Serial No. : Manufacturing sequence of product

Product Line : 1 → Line1, 2 → Line 2, ...etc.

## 10. PACKAGING

### 10.1 PACKAGING SPECIFICATIONS

- (1) 7 LCD TV modules / 1 Box
- (2) Box dimensions : 826(L)x376(W)x540(H)mm
- (3) Weight : Approx. 35 Kg (7 modules per box)

### 10.2 PACKAGING METHOD

Figures 10-1 and 10-2 are the packing method

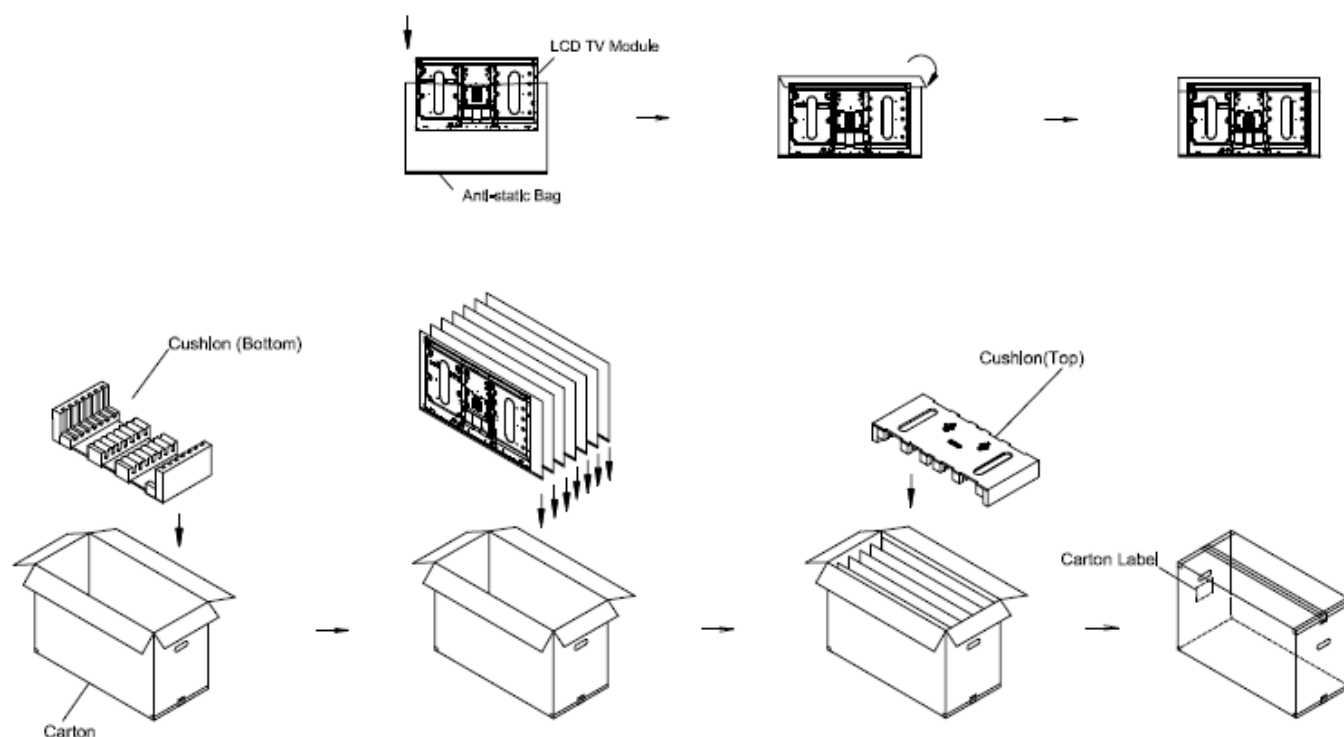
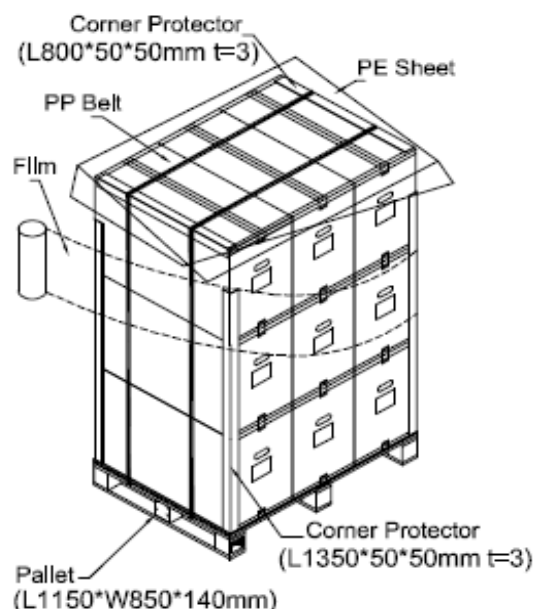
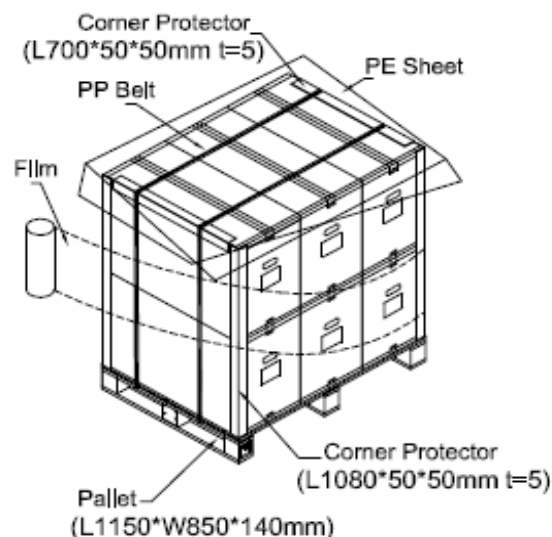


Figure 10-1 packing method

## Sea / Land Transportation (40ft Container)



## Air Transportation



## Sea / Land Transportation (40ft HQ Container)

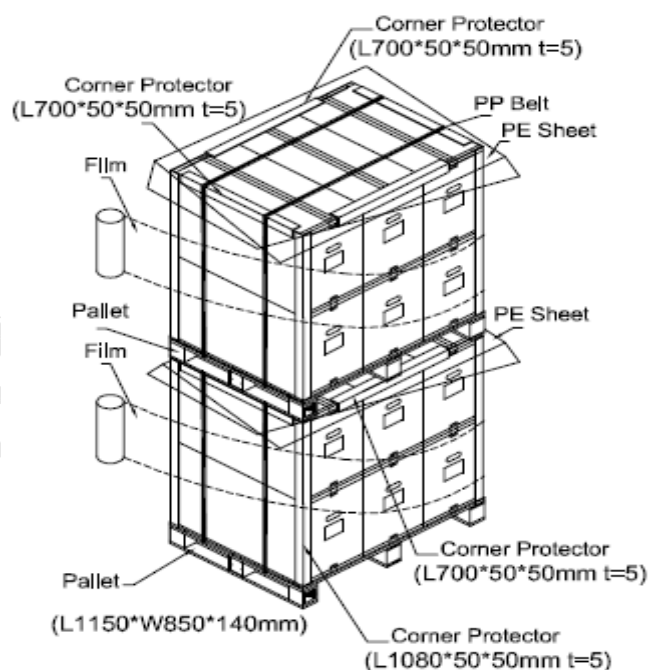


Figure 10-2 packing method

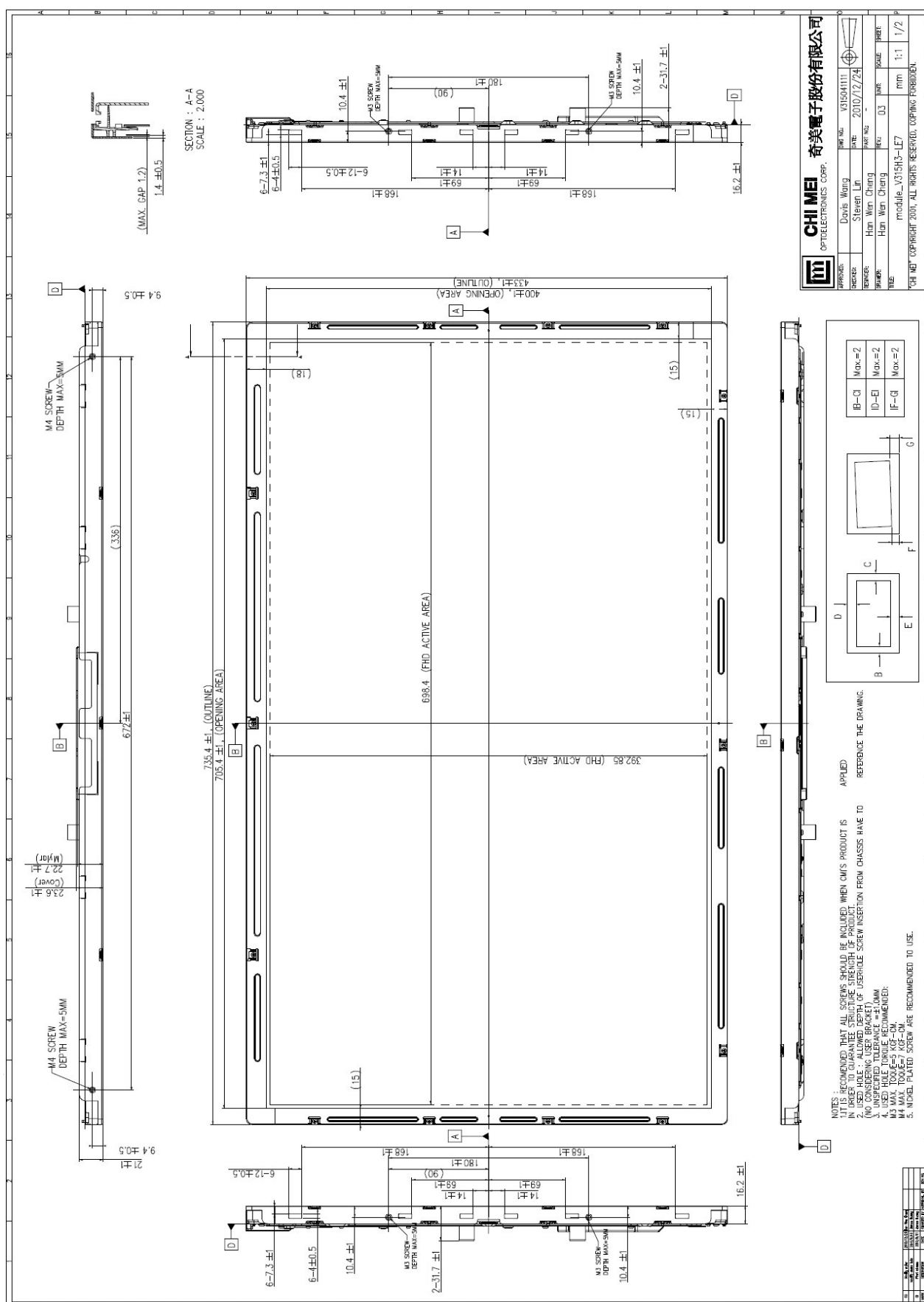
**11. INTERNATIONAL STANDARD****11.1 SAFETY**

- (1) UL 60950-1, UL 60065 ; Standard for Safety of information Technology Equipment including electrical Business Equipment.
- (2) IEC 60950-1:2001, IEC 60065:2001; Standard for Safety of International Electrotechnical Commission.
- (3) EN 60950:2001+A11, EN 60065:2002+A1:2006; European Committee for Electrotechnical Standardization (CENCLEC), EUROPEAN STANDARD for Safety of information Technology Equipment including Electrical Business Equipment.

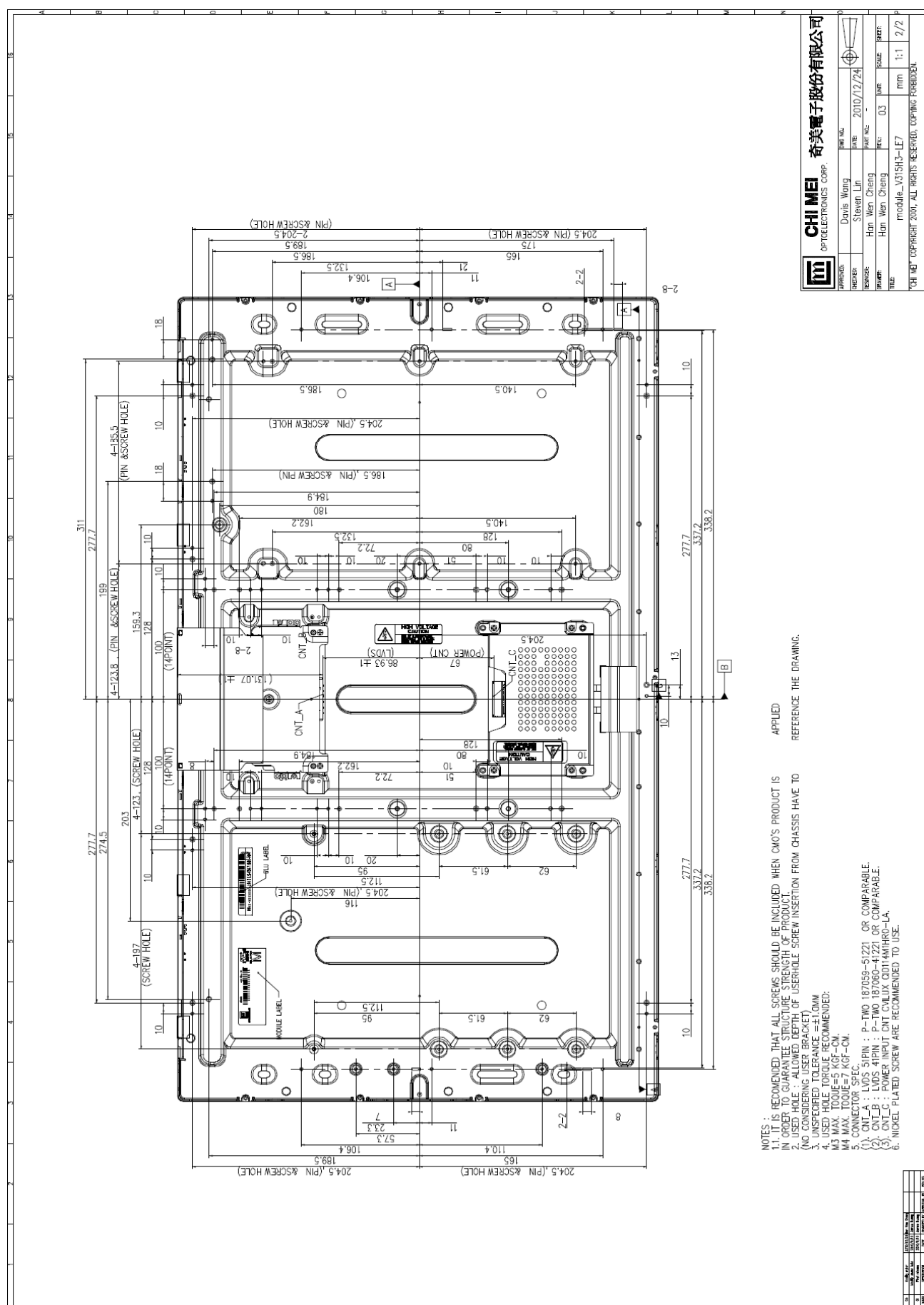
**11.2 EMC**

- (1) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 40GHz. " American National standards institute(ANSI), 1992
- (2) C.I.S.P.R "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment. " International Special Committee on Radio Interference.
- (3) EN55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment. "European Committee for Electrotechnical Standardization(CENCLEC) , 1998

## 12. MECHANICAL CHARACTERISTIC

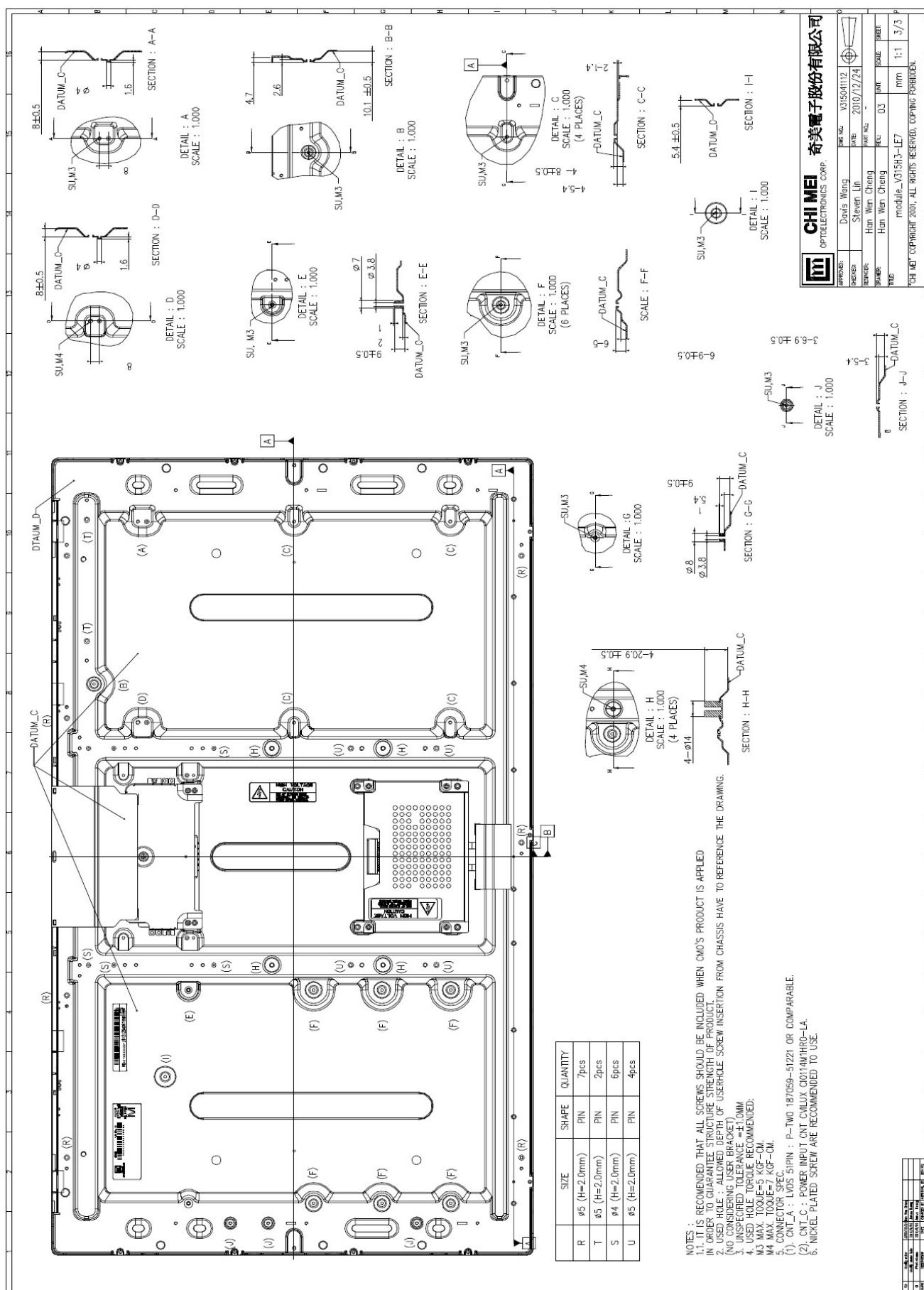


## PRODUCT SPECIFICATION





# PRODUCT SPECIFICATION





## Appendix – TWO Wire BUS INTRODUCTION

### A.1 PIN ASSIGNMENT

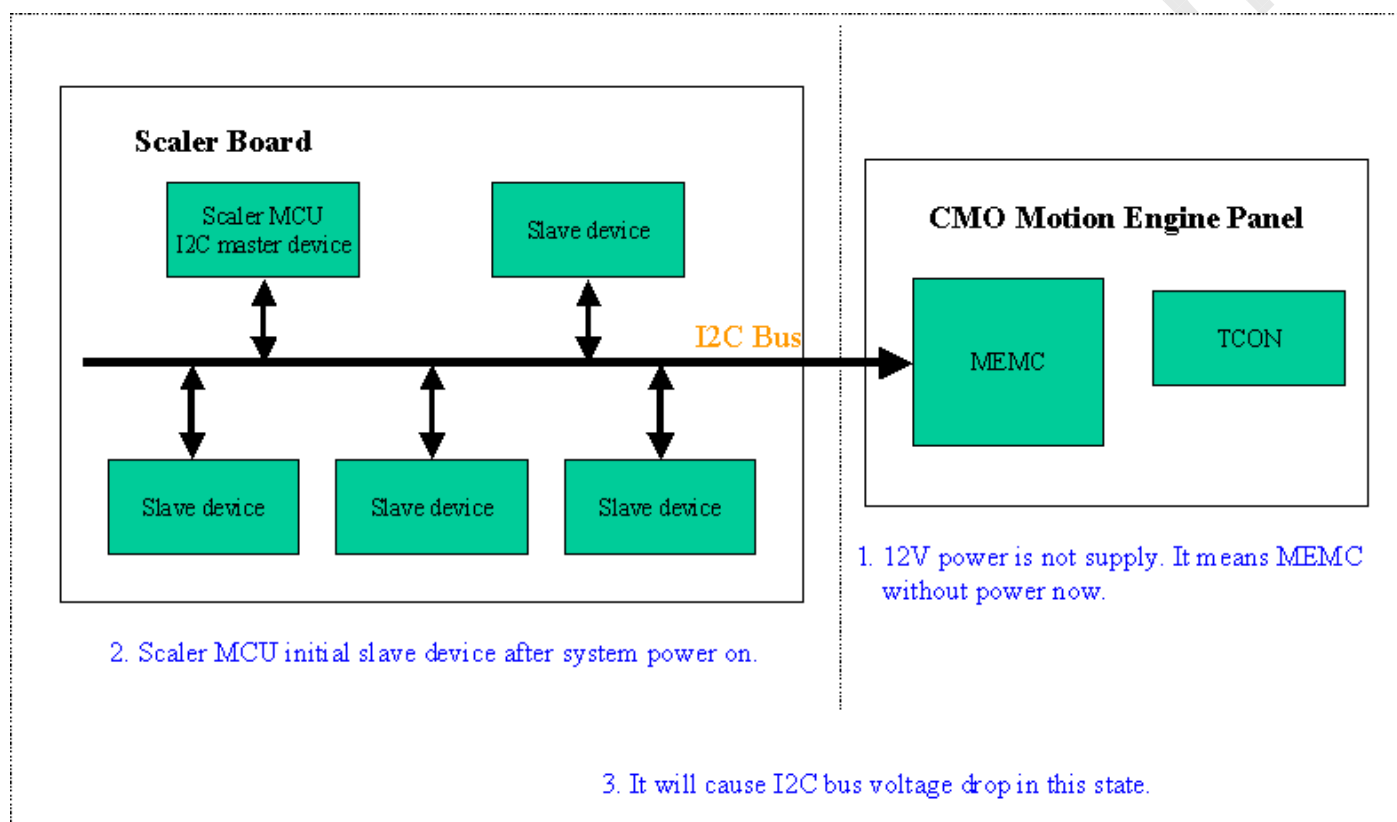
51pins LVDS connector

Pin8: SCL

Pin9: SDA

### A.2 I2C BUS APPLICATION NOTE

I2C bus: (The I2C bus must for MEMC only or prevent the I2C bus voltage drop down in initial state)



### A.3 TWO WIRE BUS DEVICE ADDRESS

Two wire device address: default is 0x40, 1 byte

Two wire command: the range is 0x00 to 0xFF, 1 byte, see the two wire command table.

**Appendix : Reliability Test Items**

|   | Test item                       | Q'ty | Condition                                                                                            |
|---|---------------------------------|------|------------------------------------------------------------------------------------------------------|
| 1 | High temperature storage test   | 3    | 60℃,240hrs                                                                                           |
| 2 | Low temperature storage test    | 3    | -20℃,240hrs                                                                                          |
| 3 | High temperature operation test | 3    | 50℃,240hrs                                                                                           |
| 4 | Low temperature operation test  | 3    | 0℃,240hrs                                                                                            |
| 5 | Vibration test(non-operation)   | 3    | 10 ~200Hz, 1G, 10 minutes for 1 cycle, X, Y, Z, each direction for 1 time.(Test environment: 25℃)    |
| 6 | Shock test(non-operation)       | 3    | 50G, 11 ms, half sine wave, ±X, ±Y, ±Z direction, each direction for 1 time. (Test environment: 25℃) |
| 7 | Package Vibration               | 1BOX | 1.14Grms Random frequency 1~200Hz 30min/Bottom, 15min/Right-Left, 15min/Front-Back                   |
| 8 | Package Drop                    | 1BOX | 1corner, 3edges, 6faces<br>(1 time/direction), 44.01KG 31C                                           |